

1 1. A method comprising:
2 securing an integrated electroosmotic pump to an
3 integrated circuit to be cooled; and
4 packaging the integrated electroosmotic pump
5 coupled to an integrated circuit with a re-combiner.

1 2. The method of claim 1 including forming said
2 electroosmotic pump in an integrated circuit die, said pump
3 formed on one side of said die.

1 3. The method of claim 2 including forming
2 microchannels to circulate a cooling fluid on the opposite
3 side of said die, and coupling said opposite of said die to
4 said integrated circuit to be cooled.

1 4. The method of claim 1 including stacking a first
2 die including said integrated electroosmotic pump on a
3 second die including said integrated circuit to be cooled.

1 5. The method of claim 4 including forming said
2 condenser on a third die and stacking said third die on
3 said first die.

1 6. The method of claim 5 including mounting a heat
2 exchanger on said re-combiner.

1 7. The method of claim 5 including coupling said
2 first die to said second die using copper-to-copper
3 bonding.

1 8. The method of claim 1 including packaging said
2 integrated electroosmotic pump coupled to said integrated
3 circuit in a flip-chip package.

1 9. The method of claim 1 including packaging said
2 integrated electroosmotic pump coupled to an integrated
3 circuit with a re-combiner in a bumpless build-up layer
4 package.

1 10. A packaged integrated system comprising:
2 an integrated circuit;
3 an integrated electroosmotic pump mounted on said
4 integrated circuit;
5 a re-combiner; and
6 a package including said circuit, said pump, and
7 said condenser.

1 11. The system of claim 10 wherein said integrated
2 circuit is part of a first die and said integrated
3 electroosmotic pump is part of a second die, said second
4 die having a first side and a second side, said pump formed
5 on said first side.

1 12. The system of claim 11 including microchannels to
2 circuit cooling fluid on said second side and said second
3 side mounted on said first die.

1 13. The system of claim 11 including stacking said
2 first die on said second die.

1 14. The system of claim 13 including a third die,
2 said third die including a re-combiner, said third die
3 stacked on said first and second dice.

1 15. The system of claim 14 including a heat exchanger
2 stacked on said re-combiner.

1 16. The system of claim 14 wherein said first die is
2 coupled to said second die using copper-to-copper bonding.

1 17. The system of claim 10 wherein said package is a
2 flip-chip package.

1 18. The system of claim 10 wherein said package is a
2 bumpless build-up layer package.

1 19. A packaged integrated circuit comprising:
2 an integrated circuit;
3 an integrated electroosmotic pump;
4 a combiner; and
5 a bumpless build-up layer package including said
6 circuit, said pump, and said combiner, said package
7 including a build-up layer that mechanically couples said
8 circuit, said pump, and said combiner.

1 20. The system of claim 19 wherein said integrated
2 electroosmotic pump is formed on a first die and said
3 integrated circuit is formed on a second die and said
4 condenser is formed on a third die.

1 21. The system of claim 20 wherein said integrated
2 circuit die is mounted on said integrated electroosmotic
3 pump die.

1 22. The system of claim 21 wherein said first and
2 second dice are coupled by copper-to-copper bonding.

1 23. The system of claim 19 including a heat spreader
2 coupled to said build-up layer.

1 24. The system of claim 20 wherein said first die
2 includes at least one electroosmotic pump on one side and a
3 plurality of microchannels on the other side, said
4 microchannels to circulate cooling fluid pumped by said
5 electroosmotic pump.

1 25. The system of claim 24 wherein said first die is
2 mounted on said second die with said microchannels facing
3 said second die.